



# State Facilities Energy Conservation Program

Guidelines for energy consumption of Missouri State  
Government Buildings per Executive Order 09-18.

**6/13/2011**

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# State Facilities Energy Conservation Program

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## **Purpose:**

The Office of Administration recognizes that the operation of state buildings is a significant factor in the energy consumption of Missouri State Government buildings. Executive Order 09-18 directs us to manage operational costs and sustain resources for future generations through efficiency and the use of clean, domestic energy resources. Increased efficiency of energy use in state government buildings will result in cost savings and the preservation of valuable natural resources for the continued economic and environmental progress of the State of Missouri.

The goals of this energy program are to save on energy and its related costs and to protect our environment for future generations. Our goal is to partner with all state agencies and employees to accomplish these objectives.

This program will be a collaborative effort including the Division of Facilities Management, Design and Construction, Department of Natural Resources, and other state agencies. In addition, we will work closely with building occupants because energy conservation can only be successful when the building occupants understand and recognize the importance of the program's objectives. We recognize that conservation starts with ideas big and small, the implementation of which can produce large savings. We will also seek public and private input, and use existing and new technologies for energy savings.

## **Scope:**

### **A. Summary of Implementation Plan Initiatives**

Executive Order 2009-18 requires the development of policies that “will result in reductions of energy consumption by 2% per year for each of the next ten years.” The Office of Administration will be the lead agency, working closely with the Department of Natural Resources for its technical, environmental and outreach expertise.

#### **The implementation plan shall consist of the following:**

1. Develop “State Facilities Energy Conservation Program” for mandatory use in all state office buildings, whether owned or leased.
2. Develop from baseline information assembled by FMDC, measurement techniques, using FMDC’s utility portal and other methods for benchmarking facilities not included.

3. Continue to review building systems and operational procedures statewide for efficiencies.
4. Identify energy-inefficient facilities through benchmarks and take necessary steps through operational enhancements or other methods to improve efficiency or reduce utility consumption.
5. Issue energy-efficient Design Standard imperatives for new construction and new leased facilities, and make those design standards available for adoption by other state agencies whose building management does not fall under the direction of the Office of Administration.
6. Aggressively confirm the measurement and verification of benchmarks and cost savings from existing energy savings contracts to ensure compliance, and build on the experiences gained through those contracts to deliver improved results.
7. Coordinate existing state energy potential with opportunities in renewable resources, and develop public-private partnerships, where available, with energy producers to produce operational savings.
8. Obtain the necessary funding resources to aggressively pursue the Governor's goals by completing energy audits and projects, using in-house resources where possible.
9. Identify and pursue opportunities to acquire funding through grants, incentives or other sources for reduction of utility impacts on budgets.
10. Maximize the role that state employees and others will play in the implementation of this plan by:
  - (a) Developing and initiating a high-visibility and consistent program to engage state employees in helping to save energy.
  - (b) Appointing an energy coordinator in each building to coordinate and promote various strategies to encourage employee commitment and cooperation.
  - (c) Developing and funding an incentive program that rewards participation in conservation efforts by employees and users at state buildings for energy-saving ideas, including recognition by Governor and awards to promote competition between departments, facilities and buildings.
  - (d) Using communications and public information to achieve energy-efficiency improvements.
11. Coordinate the planning and implementation with all state departments:
  - (a) To ensure agency buy-in and benefit from agency expertise and experience;
  - (b) Coordinate training as necessary;

- (c) Enlist and demonstrate support for the Governor's executive order by introduction of plan to Department Directors, including energy improvements as a feature of Executive Dashboard;
  - (d) Develop strategy to ensure that adequate resources, both human and financial, are committed to the project.
12. Communicate with DNR, MoDOT, Conservation, and Higher Education institutions and other public and private agencies to share information, transfer technology ideas, and identify possible shared funding sources.

## **B. Five Key Elements**

1. Employee and Public Awareness Action Plan
2. Employee Energy Participation Action Plan
3. Energy Conservation Action Plan
4. Commissioning and Benchmarking Plan
5. Building Equipment Retrofits and New Construction Action Plan

### **1. Employee and Public Awareness Action Plan**

Communication is the key to developing a successful energy saving program. The following steps will achieve energy efficiency improvements through shared information and strategies across all Departments and with public entities.

1. Initiate a high-visibility program to engage state employees to help save energy. This initiative could include the appointment of an energy coordinator in each building who will keep the subject of energy efficiency in front of employees through newsletter articles, e-mail, and various other strategies designed to promote and maintain employee commitment and cooperation.
2. Offer recognition and rewards for saving energy, promoting competition between departments, facilities, and buildings.
3. Communicate with DNR, MoDOT, Conservation, Higher Education institutions and other agencies to share information, transfer technology ideas, and identify possible shared funding sources.
4. Communicate through the public information office to show we are leading by example. Show how this initiative is working through the media and web presence.

### **2. Employee Energy Participation Action Plan**

The Employee Action Plan consists of seventeen (17) ways each state employee can help to reduce energy in your work area.

1. When available, use revolving doors when entering and exiting buildings. Heat loss or gain through building openings can account for up to 18% of all building heating and cooling losses. Using revolving doors significantly

reduces infiltration of air that enters or escapes from buildings.

2. Refrain from using electronic doors, which should be used only for handicap access.
3. When possible, use the stairs instead of elevators. This reduces energy consumption as elevators can use up to 15% of a building's electrical consumption.
4. Open the blinds on sunny days in cooler months to increase warmth using solar energy, and close blinds to reduce the heat from the sun in warm months, reducing the building cooling needs.
5. Space heaters, fans and other plug in loads are prohibited in all state buildings because of safety concerns and electrical costs. These types of appliances consume significant amounts of electricity and are potential fire and safety hazards. Dressing in layers allows you to adjust to the temperature in the building.

(a) Space Heaters

- i. FMDC continues to allow space heaters as ADA Accommodations.
- ii. Agency is to purchase the type space heater recommended by FMDC, current model is oil filled flat panel electric conduction heater, 400 watts, 1386 BTU, equipped with a tip-over safety switch, auto over heat protection, and is UL approved.
- iii. The Agency will maintain and provide to FMDC a simple up-to-date list of the names of staff with space heaters approved for accommodations and which office they are located in to provide FMDC staff a quick and easy method to verify whether or not a space heater in an office has been approved.
- iv. Agency will strictly enforce the no space heater rule in offices except for those approved as ADA Accommodations.
- v. Agency will closely examine accommodation requests to make sure they meet the requirements of the ADA before a request to approve a space heater is submitted to FMDC.
- vi. Agency staff that receive a space heater as an ADA Accommodation agree to unplug the space heater when it is not in use as part of the accommodation.

(b) Desktop Fans

- i. Agency is to purchase desktop fans up to 6" and monitor the use of fans to conserve energy.
6. Learn how to use the power management features on your computer. The typical computer and monitor can consume up to 60% of a computer's power requirement. Because of their numbers in a typical office, computers are generally the largest energy consumer followed by photocopiers, fax

machines and other office equipment. Most computers and monitors now come with power management features to power down your computer and monitor. Talk to your system administrator about how to enable the power management feature for the computer and monitor. Equipment not furnished with a power management system should be manually shut off at the end of each day.

7. Eliminate hot plates, coffeepots, refrigerators, microwaves and other small appliances in all work areas; they are prohibited in office spaces in all state buildings. Most office areas provide a kitchen or break area and are pre-wired for these applications. Use of these types of appliances outside of these designated areas can overload circuits and could be a fire and safety hazard.
8. When washing dishes in office kitchens, try to wash all of your dishes at once instead of one at a time. Water conservation saves money and preserves our natural resources for future generations. When washing your hands in restrooms, please only turn on the faucet when needed and turn off as soon as you are finished. Use cold water to wet hands for washing and then hot water to rinse. This will save energy and reduce energy costs.
9. Turn off lights in office areas during evenings and weekends. Turn off lights in unused common areas such as copy rooms, break rooms, conference rooms and rest rooms. Turn off task lights at night and whenever you are away from your desk for an extended period of time. If there are areas that could be de-lamped or fixtures removed, please contact FMDC Tenant Request and have them removed. Exterior lighting should be shut off automatically by photo cell or timer during the daylight hours or scheduled off as soon as possible after normal working hours. Parking lot lights should be on a photo cell timer to cycle off during day light hours.
10. When replacing lights or light fixtures, please contact FMDC Tenant Requests for the most energy efficient lights being used in your facility. Absolutely no incandescent lights or T-12 Fluorescent light fixtures are to be installed in state buildings.
11. Do not use lights for plants.
12. Turn off all lights, except security lights, if you are the last person leaving a room.
13. Unplug infrequently used equipment, such as televisions and VCRs, because they consume power even when turned off.
14. Make sure that plants, books or furnishings do not block air vent grills. If you are hot or cold, please contact FMDC Tenant Request to have temperature regulated according to building standards. Blocking air vents can reduce fresh air and increase health problems.
15. Schedule meetings during normal working hours as large lighting,

heating, and air conditioning (HVAC) systems are very costly to operate.

16. The temperatures in all State buildings should be held between 76° F to 78° F in the summer and 68° F to 71° F in the winter. Specific facilities may require variation in temperature due to building operation and special needs.
17. Do not open windows in state office buildings as this will introduce humidity, mold and extreme temperatures into tenant areas. This will increase the heating or cooling load and may overload the HVAC system increasing energy costs.

### **3. Energy Conservation Action Plan**

This section is intended for use by Facilities staff in state buildings. The following covers basic preventive maintenance of energy using equipment, calibration of HVAC and lighting systems, and operational methods necessary to fine tune buildings for maximum energy savings.

#### **General**

1. Track and monitor building energy consumption. Monitoring will increase energy awareness, help identify high usage periods, and allow for the evaluation of newly implemented conservation initiatives. The effectiveness of any energy conservation procedures or operational changes implemented must be verified and measured.
2. Assign a facility operational staff person who will have the responsibility of reviewing and verifying the utilities usage at each building.
3. Develop and implement standard procedures for reviewing, approving, and logging the monthly utility billing information into an enterprise central data warehouse from the facilities through the payment process.
4. Facility Managers and staff shall involve building tenants in energy conservation efforts by seeking their help, assistance, ideas, and participation in energy conservation at each building.
5. Schedule group activities in an area with the least energy use in the building. If possible schedule evening meetings in areas that can be heated and cooled individually, rather than heating or cooling the entire building. Provide work stations for staff working in off hours that can be individually heated or cooled rather than providing heat or cooling to an entire floor or building.
6. Schedule teleconferencing whenever possible. Teleconferencing can reduce energy use and save travel costs.



## HVAC (Heating, Ventilation and Air Conditioning)

1. Set heating temperatures at the following maximum temperatures:
  - 68° F to 71° F for all occupied areas and cafeterias;
  - 65° F to 67° F for all lobby corridor and restroom areas;
  - 60° F to 62° F for all storage areas and tunnels;
  - Settings for all of the above referenced spaces must be lowered to 60° F to 62° F during non-working hours;
  - 55° F for all unoccupied spaces;
  - 55° F for all vacated spaces.
2. Set cooling temperatures at the following minimum temperatures:
  - 76° F to 80° F for all occupied space excluding reheat systems;
  - Unoccupied settings for air-conditioning, turned off or raised to 85° F during nights and weekends.
  - In implementing Part 2. above, set points should be maintained within the allowable ranges as required to achieve a target temperature of 68° F during the heating season and 76° F during the cooling season. Due to the age of various State HVAC systems and the type of temperature control systems currently in use, occupants may experience a range of temperatures within those allowed above. If the set point drops below 65° F during the winter or is above 80° F during the summer occupied hours, please inform FMDC building manager as soon as possible.
  - In selected systems that use reheat, the building temperature control system may require re-commissioning to achieve the desired energy saving effect of the temperature set point range of Part 2 above. In all cases FMDC energy staff will re-commission the building temperature control system to achieve energy savings and certify that the building complies with the FMDC State Facilities Energy Conservation Program.
3. Computer rooms, special use facilities, and special care facilities are exempted from the heating and cooling set points given above. Additional building spaces may be exempted from all or part of these requirements, pursuant to the approval of the Facilities Management, Design and Construction Director.
4. Heating and cooling should resume normal set point no sooner than 45 minutes before the scheduled opening of the building time.
5. Heating and cooling should be set back 30 minutes before the scheduled building closing time.
6. Perform all Preventive Maintenance on HVAC equipment including cleaning or replacing air handling unit filters regularly. Keep outside units free from leaves or debris that may clog the coils. Clean radiator surfaces frequently to insure a free flow of heat. Make sure that indoor heating and cooling coils are kept clean.

7. Verify that the outside air dampers close during unoccupied hours, including during morning warm-up periods. Fresh air is critical while the building is occupied, but heating outside air when it is not needed increases energy costs. If possible all fresh air handling equipment should be controlled by CO2 controls.
8. Be sure motor-operated dampers are operating properly.
9. Confirm that the adjustable speed drives are running properly. If they are operating constantly at maximum speed, they use more energy than the directly connected motor. Adjustable speed drives have an output monitor to report percentage of operation.
10. In the winter, close window coverings at the end of the day to cut down on heat loss.
11. In the summer, close window coverings during the day to avoid the heat gain of direct sunlight, except for conflicts with day lighting.
12. Do not set a higher thermostat setting to raise the temperature faster, and do not set a lower thermostat setting to lower temperature faster. This could cause the system to over-respond and waste energy.
13. Check to make sure that exhaust fans operate only during occupied periods unless required by building code or life safety code to operate continuously.
14. Check that dampers on exhaust fans close when the fan is not operating.
15. Inspect and adjust fan belt tension if necessary.
16. Inspect control schedules and zones so that the sections of the building or buildings are being controlled to their proper occupied and un-occupied set points.
17. Ensure thermostats locations represent an accurate reading of the space, if they do not, consider relocating to avoid drafts and inaccurate readings.
18. Confirm that outside air economizers are functioning properly to take advantage of free cooling. Most systems can obtain some free cooling from the outside air economizer. Free cooling in most areas of Missouri can be achieved with the ambient air conditions below 62<sup>0</sup> F. outside air temperature.
19. Make sure areas with multiple units do not have re-circulation issues that cause simultaneous heating and cooling. Verify proper operation of valves, dampers and controls.
20. Monitor boiler stack temperatures. If the stack temperature is in excess of 100<sup>0</sup> F above the steam or hot water discharge temperature, schedule a tune-up of the boiler burner system. On large boiler systems, annual or bi-annual tune-ups may be required.

21. Turn off circulation pumps during unoccupied times if no freeze hazard conditions exist.
22. Check control sequencing for multiple chillers and boilers. For light load operation, use the smallest and most efficient chiller or boiler available to avoid frequent equipment cycling and ensuring an efficient operation.

## **Lighting**

1. Turn off all lights in unoccupied areas, excluding security, night, or emergency lights.
2. Turn off lights near windows or install light sensors to automatically shut off lights when daylight is adequate. Install occupancy sensors to automatically shut off lighting in offices when not occupied.
3. Ensure time clocks and photocells that turn on electric lights after dark are operable and set correctly.
4. Make sure time clock controlled or computerized controlled inside lighting systems are sequenced to the operational times required and are re-adjusted to daylight savings time adjustments. Make sure time clock and computer controlled inside and outside lighting systems is sequenced to the operational times and are re-adjusted to reflect daylight savings time and monthly to match dusk operation. About a minute of sun light is gained or lost each day depending on the season. You may wish to incorporate the operation of a time clock and photo cell control in series to reduce clock adjustments.
5. Use the appropriate size and the most efficient fixture and bulbs for the application.
6. Light levels should be in accordance with the “recommended luminance categories and luminance values for lighting design.” Some areas may have more lighting than required. Check lighting levels by measuring the current lighting levels and reduce excess lighting when possible.
7. Direct the janitorial services to only light the area of the building they are working in, rather than having the entire building lit (when wired to allow this). Direct them to ensure lighting is turned off as they leave an area.
8. Task lighting (desk lamps) should be high efficient fixtures. Incandescent lamps should be replaced with the most efficient fixtures and bulbs.

## **Water**

1. Incorporate low flow water measures when possible, such as low flow fixtures, faucets, and shower heads.
2. Watering landscape can waste water and electricity since water gets there with the use of electric pumps. Make sure you water landscape during early morning or late evening to avoid evaporation. Do not over-water

landscape; follow local watering guidelines for proper landscape care.

3. If possible, plant native species that require less irrigation and would reduce water and electrical energy cost.
4. Make sure landscaping water is not connected through a domestic water meter. If irrigation water system is connected through domestic water, you will pay sewer fees on this water.
5. If possible, install rain water recovery systems to be used for irrigation and gray water usages.
6. Install timers on hot water heaters to cycle off after normal hours and on weekends. Insulate hot water heaters when possible.

### **Energy Savings Programs, Projects and New Construction**

1. For comprehensive energy efficiency improvements in existing buildings, agencies can utilize Facilities Management, Design and Construction's Energy Savings Program. The program pays for itself from utility cost savings. Improvements include the following examples:
  - Building automation systems
  - Lighting upgrades
  - Lighting controls – photocells, occupancy sensors
  - HVAC upgrades
  - Water conservation
  - Energy efficient windows
  - Building envelope improvements
  - Energy efficient roofing
2. If the maintenance operating budget permits, incorporate the following:
  - Replace incandescent bulbs with energy efficient fixtures and bulbs, which can last up to nine times longer;
  - Replace the T-12 bulbs with a minimum of T-8 bulbs and electronic ballasts; Replace incandescent exit lights with LED lights, which reduce costs of operation and maintenance;
  - Install low flow water conservation showers, faucets, and toilets; Install variable speed drives on air handlers, pumps, and fans.
3. All new equipment replacement or construction must meet or exceed the most recent energy efficiency standards of the International Energy Conservation Code.
4. Confirm that the amount of outside air (OSA) matches the occupant load. Carbon dioxide monitors should be installed along with controls that will only bring in as much OSA as necessary for the current

occupant load.

5. Keep your HVAC systems tuned with periodic maintenance and measurement of the operating efficiency.
6. Always replace failed electric motors with higher efficiency motors when possible. Rebuilt electric motors will sometimes lose efficiency from their original rating.
7. Facility Managers should review utility loads and benchmark information to better understand the facilities operation, identify system failure and improve on additional conservation opportunities.
8. Facility Managers should contact utility representatives to review rate schedules and to determine if rate savings initiatives, such as load shedding or peak shaving, would be beneficial to the facilities operational utility expenditures.

#### **4. Commissioning and Benchmarking Action Plan**

Benchmarking allows energy professionals to track energy usage in multiple buildings across the state through a utility portal system. The following steps outline the process to capture this information, methods used to analyze energy consumption for benchmarking, and for continual commissioning of building systems.

1. Develop measurement techniques, using FMDC's utility portal for included buildings. Gather baseline information through past bill invoices and agency spreadsheets for buildings not included.
2. Through the FMDC energy portal, identify energy-inefficient facilities through benchmarks and constant soft commissioning of systems, and take necessary steps through operational enhancements or other methods to improve efficiency or reduce utility consumption.
3. Provide benchmark reports including electrical consumption, costs and percentage of energy savings.

#### **5. Building Equipment Retrofits and New Construction Action Plan**

The following steps mandate all new construction or replacement of energy using equipment meet or exceed the most recent energy efficiency standards of the International Energy Conservation Code (IECC).

1. The FMDC State Building Energy Efficiency Design Standards are posted on-line at <http://oa.mo.gov/fmdc/energymgmt/>.

2. FMDC will control all new equipment retrofits and construction and issue energy-efficient Design Standard imperatives for all new work in state buildings under the umbrella of Office of Administration including leased facilities.
3. All equipment replacement (electrical, HVAC, plumbing, water, ITSD, etc.) must meet or exceed IECC, ASHRAE and Energy Star codes and standards.
4. FMDC will continue to investigate new energy technologies such as photovoltaic, wind, and solar, to help reduce operational costs and sustainable resources as these technologies become more cost effective.
5. Continue as budget allows using Energy Savings Contracts to upgrade inefficient equipment and building systems such as lighting, HVAC, and roofing. Adopt alternate energy sources including wind, solar, biomass boilers, woodchip boilers and ground water heat pump systems.